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CENTRAL INTELLIGENCE AGENCY

REPORT NO. [REDACTED]

## INFORMATION REPORT

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COUNTRY Germany/USSR

CASE 7608

DATE DISTR. 19 Oct. 1951

SUBJECT Test of German Annular Bearing Made of Soviet Steel

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SUPPLEMENT TO  
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examination here reported on two identical bearings produced during late 1949 or early 1950 from steel furnished by the Soviets, at the Leipziger Kugelagerfabrik "DKF" Leipzig, Sovzone, Germany.

## 1. The two identical bearings tested are described as follows:

a. Both are "Conrad" type ball interchangeable with USA Fafnir bearing number 38 K.

b. Boundary dimensions of the bearings tested are as follows:

- (1) Bore -- 8mm
- (2) Outside diameter -- 22 mm
- (3) Width -- 7 mm
- (4) Number of balls -- 7
- (5) Ball diameter -- 5/32 inch

## 2. The tolerances of DKF bearings 1 and 2, and of a Fafnir 38 K bearing used as a control are reported as follows:

Tolerances

Bearing No.	Parallelism of Sides	Side run out	Eccentricity	Groove Parallelism with Side
No. 1				
Inner race	Not Meas.	.0007	.0006	.0003
Outer race	.00035	.0007	.0007	.0011
No. 2				
Inner race	.0003	.0003	.0005	.0003
Outer race	.00025	.0004	.0002	.0002
No. 38K				
Inner race	.0003	.0003	.0003	.0003
Outer race	.0004	.0006	.0006	.0006

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3. Examination of the finishes on these bearings has revealed the following:
- Bores, faces, and races of bearings Nos. 1 and 2 were very rough.
  - Finishes of the outside diameters of bearings Nos. 1 and 2 were within the range of a good "commercial" grind.
  - Finishes on balls of bearings Nos. 1 and 2 were in the same class as USA "regular" finish, with roughness in micro-inch readings ranging from 1.1 to 1.4.
4. Wavometer readings taken by measuring the noise, in empiricle units approximately proportional to surface roughness, at 1800 RPM were as follows:

	<u>Bearing No. 1</u>		<u>Bearing No. 2</u>		<u>Bearing No. 38K</u>	
	<u>Inner Race</u>	<u>Outer Race</u>	<u>Inner Race</u>	<u>Outer Race</u>	<u>Inner Race</u>	<u>Outer Race</u>
High band	16	2.5	2.5	4	1	2
Low band	15	13	9	10	12	15

5. Bearings were run for sound, audibly measured, in a motor test with the following results:
- Bearing No. 1 ran rough and noisy.
  - Bearing No. 2 ran smooth but noisy.
6. Hardness determinations on bearings Nos. 1 and 2 were reported as follows:

	<u>Bearing Number 1</u>	<u>Bearing Number 2</u>
Hardness Inner Race	82 1/2 Rockwell "A" 62 Rockwell "C"	83 Rockwell "A" 62 Rockwell "C"
Hardness Outer Race	83 Rockwell "A" 63 Rockwell "C"	84 1/2 Rockwell "A" 66 Rockwell "C"

7. A metallurgical examination of one of the German bearings has yielded the following composition data:

<u>Part</u>	<u>%C</u>	<u>%Cr</u>	<u>%Ni</u>	<u>%Mo</u>	<u>Equivalent to SAE Steel No.</u>
Outer ring	1.00	1.30	0.10	0.02	52100
Inner ring	1.06	1.06	0.21	0.03	51100
Balls	1.17	0.43	0.30	0.02	50100

8. Conclusions drawn from the reported examination are as follows:
- The bearings were assembled with pressed metal retainers, plain and finger half. The fit of retainers to bearings was poor. The die work was poor as indicated by failure of the upper half of the retainer pockets to follow the contour of the balls.
  - With the exception of one ring, the race forms were poor. Contours ranged from a 50.5% outer race contour to a 54% inner race contour.
  - Shallow races were found on all rings. The German inner ring race depth was 9.6% of the ball diameter and the outer ring race depth was 8% while USA practice calls for race depth on all rings equal to 11% of the ball diameter.

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- d. The fit of the bearings was rated as "P" by standards used by the USA manufacturer. This rating was based on radial clearances measured as .0007 inch for bearing No. 1 and .00045 for bearing No. 2.
- e. The side run out, eccentricity, and groove parallelism of bearing No. 1 are outside Annular Bearing Engineers Committee (ABEC) limits as is the eccentricity of bearing No. 2.
- f. The steels used are within the limits of USA practice, but in this country it would be more usual to use SAE-52100 for rings and SAE-51100 for balls. Some American manufacturers use SAE-50100 for small balls.
- g. The bearings are not suitable for use in instruments because of their excessive noise levels, roughness, and tolerances outside ABEC limits.

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